Endobiliary Stenting of Common Bile Duct after Open CBD Exploration for Choledocholithiasis

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Abstract
Background: CBD stones when present need to be dealt with in order to prevent the complications related to them. Conventionally, T-tube drainage as a decompression procedure after open choledochotomy for choledocholithiasis has its own share of complications.

Aim: To assess the feasibility of using a biliary stent as a decompression procedure in patients of choledocholithiasis undergoing CBD exploration.

Design and Place: This was a prospective observational study where 30 patients after being admitted in Post Graduate Department of Surgery Government Medical College, Jammu over a period of one year w.e.f. November 2017 to October 2018 with diagnosis of choledocholithiasis were included in study. Method: 30 patients selected in study were subjected to open CBD exploration for choledocholithiasis. Following CBD exploration, they underwent primary closure of the choledochotomy over a biliary stent.

Result: Primary closure of the CBD over biliary stent is a safe procedure with lesser mortality and morbidity.

Conclusion: Closure of CBD over a biliary stent is a safe modality for management of CBD stones who undergo open CBD exploration for choledocholithiasis.

Keywords: Choledocholithiasis, Biliary Stenting, T-Tube drainage, CBD

Introduction
Common Bile Duct (CBD) stones once identified may need removal and in approximately one third of patients, small stones may spontaneously pass down the common bile duct within 2 months without the need of any intervention.[1] The remaining will require an intervention to extract the stone and relieve the obstruction.

CBD stones are of two types: primary and secondary. Primary stones (15%) are formed within the bile duct and Secondary stones (85%) are the ones which migrate along the biliary system from the gallbladder.[10] Choledocholithiasis may be silent or cause symptoms like jaundice, pain and fever especially in the elderly.

Traditionally, CBD stones were diagnosed with intra-operative cholangiography. Routine use of choledochotomy would minimize the incidence of retained stones, but may lead to stricture at later stage thereby increasing morbidity and mortality as reported by Mc Sherry.[7] Newer imaging modalities such as ultrasonography, Magnetic Resonance Cholangio-pancreaticography (MRCP), Endoscopic retrograde Cholangio-pancreaticography (ERCP) and Endoscopic Ultrasound are more reasonable methods of identifying and treating CBD stones.[18]

CBD stones once confirmed, have to be extracted to prevent the complications. Nowadays open exploration has become less common as advanced
and minimal invasive techniques are available for removal of CBD stones. Langenbach in 1884 was the first who suggested choledochotomy for CBD stones whereas, the first open common bile duct exploration was performed by Robert Abbe in 1889, a New York surgeon.

CBD stone management includes choledochotomy in the supra-duodenal part followed by extraction of stone and confirmation of complete clearance of CBD by passing a soft catheter or dilator proximally and distally. Cholangiography or choledochoscopy can also confirm complete clearance of CBD. Management after choledochotomy can be either by primary closure of CBD over endobiliary stent /T-tube drainage or by bilio-enteric bypass. T-tube drainage after CBD exploration was first described by Deaver in 1904 and had been the method of choice for CBD decompression following choledochotomy.

CBD decompression by using a internal biliary stent is an effective alternative. Dr William Halsted in 1917 had described the use of primary closure after CBD exploration. Mirizzi proposed to avoid placing of a tube in a delicate contractile structure like CBD, if possible. Choledochorraphy, as per him requires Patency of the papilla of Vater, Complete removal of intraductal calculi, Normal pancreas and Meticulous suturing of the duct.

Indications for closure of CBD over internal biliary stent:

1. Removal of CBD stones without undue manipulation or trauma to the wall or lumen of the CBD.
2. Slight or moderately thickened duct wall which is neither oedematous nor acutely inflamed.
3. Stones are not found in an otherwise normal appearing CBD or even a CBD that is dilated. Through this study we wanted to assess the feasibility and clinical outcome of biliary stent decompression of CBD following open choledocholithotomy in a setup where advanced endoscopic or minimal invasive equipments or expertise is not available.

Material And Method

This prospective randomized comparative study was conducted on 30 patients undergoing open CBD exploration in the Department of Surgery, Government Medical College Jammu from 1st November 2017 to 31st October 2018. Patients underwent primary closure of the choledochotomy over a biliary stent after open CBD exploration for CBD stone.

<table>
<thead>
<tr>
<th>INCLUSION CRITERIA</th>
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<tr>
<td>All patients undergoing elective open choledocholithotomy</td>
<td>Age &gt; 75years</td>
</tr>
<tr>
<td>ASA I</td>
<td>Previous history of choledocholithotomy</td>
</tr>
<tr>
<td>ASA II</td>
<td>Deranged coagulation profile</td>
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<td></td>
<td>Severe respiratory illness.</td>
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</table>

Preoperative evaluation:

Detailed clinical history and physical examination of the patients was done. Study details and informed consent was taken. Baseline tests plus radiological evaluations like Ultrasound Abdomen and Magnetic Resonance Cholangiopancreatography(MRCP) for
confirmation of the ultrasound findings were done pre-operatively.

Injection Vitamin K was given to patients with jaundice or deranged PT. Preoperative antibiotics were administered in all patients and the operation time from skin incision to the application of the last stitch was noted in all cases.

**Surgical Procedure**

In all patients, choledochotomy was done insupraduodenal part of CBD. Cystic duct was ligated before CBD exploration so that gall bladder manipulation would not force small stones to migrate through the cystic duct down into the common duct during or after CBD exploration. After stone removal and confirmation of clearance by cholangiogram or choledochoscopy, patient underwent primary closure over a biliary stent.

**Technique Of Biliary Stent Placement**

Biliary stent (Indovasive, India) a 7 Fr 10cm straight flap, was introduced into the CBD through the choledochotomy by the technique as described by Kim et al[6] and Perez et al.[11] The proximal flap of the stent was engaged at the junction of the right and left hepatic ducts and the distal flap just beyond the sphincter into the duodenum. Choledochotomy was then primarily closed over this stent using continuous 3-0 vicryl sutures.

**Postoperative Evaluation:**

All patients were kept nil by mouth(NBM) and on parenteral fluids till their bowel activity recovered. Oral intake was allowed in the absence of vomiting and ileus. The patients were observed for any complications. Abdominal drain in subhepatic was removed once the drainage had reduced to a negligible amount. Serum amylase was done on the first postoperative day and LFT on second postoperative day. Stitch removal done on 10th to 12th post-operative day.

**Follow Up**

Before discharge, all patients were subjected to an ultrasound abdomen to rule out biliary leak, intra-abdominal collection, residual stones or any other complication. Biliary stent was removed by upper gastrointestinal endoscopy after a period of 4 weeks.

**Observation**

This study was conducted in the Department of Surgery, Government Medical College Jammu from 1st November 2017 to 31st October 2018. 30 patients underwent open CBD exploration followed by primary closure over biliary stent.

**1.Age/Sex Distribution**

There were 20%(n=6) males and 80%(n=24) females. Age of the patients varied from 26-74 years with a mean age of 50.6 years.

<table>
<thead>
<tr>
<th>Age Group(in years)</th>
<th>Males</th>
<th>Females</th>
</tr>
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<tbody>
<tr>
<td>20-35</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>36-50</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>51-65</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>&gt;65</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

**TABLE 1: Age/ Sex distribution of patients with CBD stones.**
Size Of CbD/Number Of Stones On UsG Abdomen
30 patients were evaluated for number of CBD stones on USG abdomen, out of which 22 showed single stone while 6 showed multiple stones. 2 patients did not show any stone on USG abdomen in which MRCP was done. The mean CBD diameter on USG abdomen was 11.8 mm and on MRCP varied from 11 mm to 17.6 mm.

Duration Of Surgery
The operating time for patients ranged from 110 to 180 minutes with a mean of 121.6 minutes. The operating time was recorded from the skin incision till the application of last suture.

<table>
<thead>
<tr>
<th>No. patients</th>
<th>Of Mean</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>121.6</td>
<td>110</td>
<td>180</td>
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</table>

Table 2: Duration of surgery

Post Operative Hospital Stay
The post operative stay in hospital for patients in Group A ranged from 4 to 12 days with a mean of 7.05 days.

<table>
<thead>
<tr>
<th>N(no. of patients)</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>7.05</td>
<td>4</td>
<td>12</td>
</tr>
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</table>

Table 3: Duration of post operative stay in hospital

Stent Removal
Biliary stent was removed in 26 patients after 4 weeks while 4 patients had biliary stent removal at the end of 6 weeks.

Complications
Mean duration of abdominal drain removal postoperatively was 3.90 days. 3(10%) patients had history of Diabetes mellitus. Main wound infection in postoperative period was seen in 5(16.66%) patients out of which 2 were diabetic.

2(6.6%) patients had wound dehiscence (partial) and 4(13.33%) patients were readmitted postoperatively with symptoms of pain abdomen and vomiting. All were managed conservatively.
**Table 4: Distribution of patients according to complications (n=30)**

<table>
<thead>
<tr>
<th>Complications</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bile leak/biliary peritonitis</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Retained CBD stone</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Wound dehiscence</td>
<td>2</td>
<td>6.66%</td>
</tr>
<tr>
<td>Wound Haematoma</td>
<td>3</td>
<td>10.00%</td>
</tr>
<tr>
<td>Intra-abdominal abscess</td>
<td>1</td>
<td>3.33%</td>
</tr>
<tr>
<td>Re-admission</td>
<td>4</td>
<td>13.33%</td>
</tr>
<tr>
<td>Re-operation</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Main wound infection</td>
<td>5</td>
<td>16.66%</td>
</tr>
</tbody>
</table>

**DISCUSSION**

First successful removal of CBD stones was done by Robert Abbe. Since its description, for postoperative biliary decompression T-tube has been the procedure of choice but it is not free of complications, which are present in upto 10% of patients.[9] William Halstead and John Finney challenged the need of routine CBD drainage[3]. Primary closure of CBD over an internal biliary stent is a safe alternative.[4]

This study was conducted to assess the feasibility and clinical outcome of primary closure of CBD over a biliary stent after open CBD exploration. A total of 30 patients were included in this study. There were 80.0% females and 20.0% males in this study. This sex distribution is due to the fact that the incidence of CBD stone is higher in females as reported by Parez et al[6]. The age of the patients in this study varied from 26 to 74 years with mean age of 50.6 years.

CBD exploration has been associated with stricture formation if diameter is less than 5mm. In our study, the CBD diameter varied from 9 to 15 mm (mean 11.8mm). The minimum diameter of CBD in our study was at least 9 mm. The time taken during surgery was 110 to 180 minutes, (mean 121.26 minutes) which is well in line as reported by Teh et al (mean 174 minutes) and Kim and Lee (mean 188.3 minutes).[5,6]

It was found in our study that patients who underwent primary closure of CBD over stent, their stay in hospital was 7.5 days on an average which is in agreement with Parez et al (stent 5.2+3.3 days).[11] The benefits of a short hospital stay are well documented. Similar results regarding hospital stay have also been reported by Isla et al (2 to 5 days; mean 3 days), Kim et al (4.8 1.5 days) and Ha et al (mean 5 days). In our study, abdominal drain in sub-hepatic space was kept in all patients and removed once the drain output was minimal.

Readmission (stent 13.33%) and reoperation rate (stent 0%) in this study were comparable to the study conducted by Parez et al.[11] In all patients, stents were removed 4-6 weeks after surgery by upper GI endoscopy which is in accordance with the studies conducted (Kim et al maximum 30 days, Teh et al 4 to 6 weeks, Isla et al 3 to 6 weeks). [5, 6, 12]

**CONCLUSION**

Internal placement of biliary stent via a choledochotomy incision followed by primary closure closure is a safe alternative. It eliminates the
complications of traditional T-tube drainage with the added advantage of allowing the patient to return to unrestricted activity quickly. Although, procedure is safe and effective, it also carries risk of complications like clogging which may occur in 10-30% cases[15] by bacterial infection and other components as calcium bilirubinate and calcium palmitate with protein[16], pancreatitis due to ductal obstruction, migration proximally or distal cholangitis and perforation. This study indicates that primary closure of the CBD over biliary stent is a safe alternative.

REFERENCES

9. Moesch C, Sauterreau D, Cessot F. Physicochemical and bacteriological analysis of the contents